GEOPHYSICAL MODEL OF HOT SPRINGS Au-Ag

COX AND SINGER MODEL NO. 25a
Geophysically similar models-No. 25b-25g

Compiler - **W.D. Heran**

A. Geologic Setting

- Located along regional fracture systems associated with felsic intrusive and extrusive volcanism above subduction zones, rifted continental margins, and transform faults.
- Deposits occur in subaerial rhyolitic volcanic centers, rhyolite domes, and the shallow parts of related geothermal systems; along caldera rim fracture zones; and high angle basin and range faults.
- Deposit is usually shallow, disseminated and/or stockwork veins, containing fine grain silica and quartz in silicified volcanic breccia with gold-silver, pyrite, adularia, antimony and arsenic sulfides.

B. Geologic Environment Definition

Airborne magnetics or electromagnetic may define rhyolite volcanic centers, domes and calderas. Regional gravity low or arcuate magnetic high indicate caldera or volcanic dome (Tooker, 1985). Linear trends or breaks in aeromagnetic or gravity data, may define major structures (Tingler and Berger, 1985) . Remote sensing can identify deep-seated regional fractures, lithologic changes and alteration. Airborne gamma ray data will show host rhyolite high in all radioelements.

C. Deposit Definition

Widespread alteration may be defined by a magnetic low (Williams and Abrams, 1987; Allis, 1990). Areas of brecciation will show a gravity low (Tingley and Berger, 1985; Allis, 1990). The silica cap will be indicated by an electrical resistivity high surrounded by a low. Disseminated sulfide and clays can be mapped as an IP high (Allis, 1990). Local faults and altered areas may be defined by electromagnetic methods (Kawasaki, and others, 1986). Radioelement surveys may define alteration.

D. **Size and Shape of**	**Shape**	**Average Size/Range**
Deposit	Irregular Cone Tabular	$5.2x10^6m^3$, $.68\text{-}40x10^6m^3$
Alteration Haloe/s	Concentric	
Cap	Lens	

E. **Physical Properties** (units)	**Deposit**	**Alteration**	**Cap**	**Host**
1. density	2.0-2.9,2.5(2)	?	?	2.35-2.7,2.52(2)
2. porosity	?	?	?	?
3. susceptibility (10^{-6}cgs)	?	?	?	20-3000(2)
4. remanence	?	?	?	?
5. resistivity (ohm-m)	10-2500,300(2)	?	?	50-30002
6. chargeability (mv-sec/v)	5-150,30(2)	?	?	100(2)
7. seismic vel. (km/sec)	(low)	(low)	?	
8. radiometric				
K-%	?	(high)	?	(high)
U-ppm	?	?	?	(high)
Th-ppm	?	?	?	(high)
9. Other (specific)				

F. Remote Sensing Characteristics

Visible and near IR - lineaments reflecting major crustal weak zones; arcuate patterns reflecting volcanic centers; color anomaly due to limonite or quartz may be spectrally detectable from TIMS data. Thermal IR-use unknown.

G. Comments

Remote sensing, regional magnetics and gravity are often used in reconnaissance. Closely spaced airborne magnetic and electromagnetic surveys may further define favorable areas. A combination of detailed gravity, ground magnetics, electromagnetic and electrical surveys can define target dimensions. The Bell Springs deposit, Nevada, U.S.A. was discovered by Noranda Mining in 1979 as a result of a gamma-ray survey during exploration for uranium (Bussey and others, 1991).

Geophysical methods have been employed in recent years to identify modern hot spring *or* geothermal systems and the literature is full of examples. Hot spring Au-Ag deposits are fossil geothermal systems and many geophysical methods used to explore for modern geothermal systems will be applicable Allis (1990).

H. References

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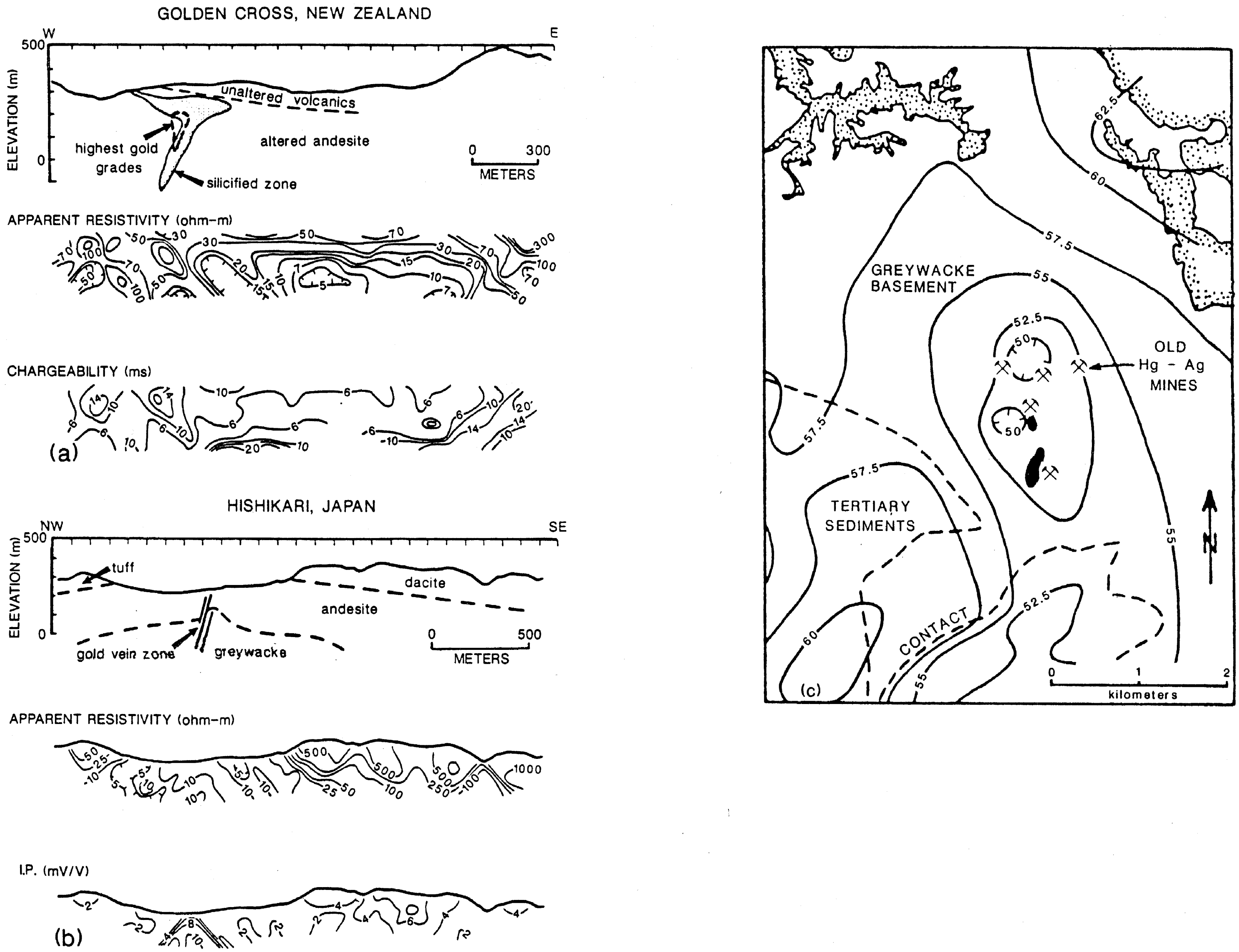

Hot Springs Au model illustrations showing (a) IP data across the Golden Cross Au deposit, New Zealand, (b) IP data across the Hishikari gold deposit, Japan, and (c) gravity data at the Puhipuhi deposit New Zealand. The Puhipuhi deposit occurs in relatively high density host rocks.